

Observations on the Spawn of Three Species of *Conus* from the Golfo Triste, Venezuela

by

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Abstract. The spawn of three species of southern Caribbean Conidae was studied. *Conus spurius* differs strikingly from all other known species of the genus by having the largest recorded eggs (690 μm in diameter) and the fewest eggs per capsule (23-83); the hatching stage is a veliconch with a shell length of 1300 μm . The spawn of *C. centurio* is also noteworthy. The eggs of most *Conus* species are either large or small; however, those of *C. centurio* are intermediate in size (275 μm). The number of eggs per capsule is 1750 in this species, and the hatching stage is a free swimming veliger 320 μm in shell length. Egg capsules of the third species, *C. ermineus*, contain an average of 2373 embryos each, and the larval shell on hatching is 295 μm in length.

INTRODUCTION

THE FAMILY Conidae is represented by a large number of species distributed mainly in the tropical and subtropical seas. Characteristics of spawning have been studied for many species, especially those from the Pacific and Indo-Pacific oceans (RISBEC, 1932; THORSON, 1940; OSTERGAARD, 1950; NATARAJAN, 1957; KOHN, 1961a, b; PERRON, 1981a, b, c, 1983). In the Caribbean area, research has been done on several species (LEBOUR, 1945; D'ASARO, 1970; BANDEL, 1976). Data on more than 45 species suggest that there is a common pattern for the egg mass and a single type of egg capsule. However, specific differences are present in the arrangement of the egg capsules and their size and shape, and in the number and diameter of the eggs.

This study describes the egg masses, capsules, eggs, and hatching stage of three species of *Conus*: *C. spurius* Gmelin, 1791, *C. centurio* Born, 1778, and *C. ermineus* Born, 1778. Several of the features described are uncommon among conids.

MATERIALS AND METHODS

Five adult specimens of *Conus spurius* were obtained by trawling at 35-40 m depth in the Golfo Triste (January 1977). These were kept in a non-circulating seawater aquarium, 22-28°C, with a mixed substratum of sand and small stones. Two egg masses laid by a single individual on the walls of the aquarium were obtained. Four speci-

mens of *C. centurio* were obtained from a depth of 42 m (February 1977) and maintained in aquaria as above. These produced five egg masses on the walls of the aquaria, as well as one on the shell of one of the adults.

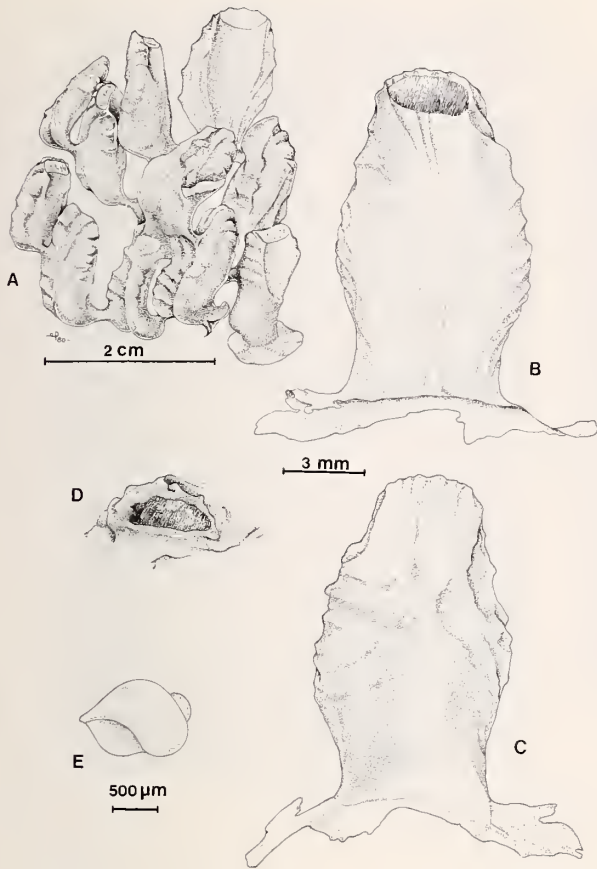
Egg masses collected from nature during trawls in the Golfo Triste at depths between 35 and 45 m were also studied (three of *C. spurius* and three of *C. ermineus*). A total of nine adult *C. ermineus* were maintained in aquaria but never laid egg masses.

RESULTS

Conus spurius

The two egg masses laid in the aquarium consisted of 18 and 21 egg capsules respectively. The capsules were arranged in levels; some were attached by a basal membrane to the substratum (the aquarium wall) and additional egg capsules were attached to the original ones. Other capsules were attached to the second layer, and so on to form six layers (Figure 1).

The egg capsule has a tongue-like shape, with a pre-formed, sub-oval exit aperture closed by a transparent membrane at the upper extreme. The strong walls of the egg capsule are opaque white, with noticeable wrinkles. The dimensions were 11.2-13.2 mm high, 7.3-9.1 mm wide, and 3.0-4.0 mm thick. Egg masses collected in nature had 32, 17, and 27 egg capsules identical to those described above.



Conus spurius. A. View of a fragment of an egg mass. B. Front view of an egg capsule. C. Back view of an egg capsule. D. View of the tip of an egg capsule. E. Outline of the shell at hatching.

Egg number in capsules was constant for each egg mass, but there was wide variation between the different egg masses examined. In the egg masses obtained in the laboratory, we counted between 23 and 36 eggs per capsule, whereas in the egg masses collected in nature, we found 23–36, 41–53, and 76–83 embryos in each egg capsule. The number of eggs seemed to be related to the size of the egg capsule.

Uncleaved ova measured between 687 and 707 μm in diameter (mean 690 μm). All of the embryos developed, and the shell size at hatching was 1200–1302 μm (mean 1297 μm), both in egg masses collected from the aquarium and from nature. The crawling stage was a veliconch with a well-developed foot and a very small velum.

Conus centurio

We obtained a total of 32 egg capsules on the aquarium walls, ordered in rows with as many as 8 egg capsules per row. An egg mass consisting of 13 capsules was also laid on the shell of one adult *C. centurio* (Figure 2).

The egg capsules were leaf-like and asymmetrical when seen from the front, with one side more developed than the other; they were almost completely transparent. The sizes of the egg capsules were very constant, being 12.8 mm high, 7.8 mm wide, and 3.1 mm thick. The capsules were not arranged in levels. In each capsule, 1731 to 1772 eggs developed. The uncleaved egg diameter was 275 μm , and the shell size of the free swimming veliger at hatching was 320 μm . Hatching occurred through a preformed, elongate escape aperture at the top of the egg capsule (Figure 3).

Conus ermineus

Three egg masses assigned to that species, common in the Golfo Triste, were found at depths between 30 and 50 m, and contained 13, 19, and 31 egg capsules respectively. The egg capsules were arranged in layers, the first of which was attached directly to the substratum (an empty shell in the three cases) with the other egg capsules attached to the first. Three layers were found in two egg masses, whereas the third egg mass consisted only of a row in a single layer. The flattened, white egg capsules were leaf-like, with relatively weak and semi-transparent walls, and bore large, superficial and transverse wrinkles. The mean size of egg capsules was 18.8 mm high, 15.3 mm wide, and 2.0 mm thick. In each egg capsule, between 2221 and 2420 embryos (mean 2373) developed, hatching as free swimming veliger larvae. The size of the larval shell upon hatching was 295 μm . Escape was made through a very elongate, preformed aperture at the top of the capsule on the upper margin (Figure 4).

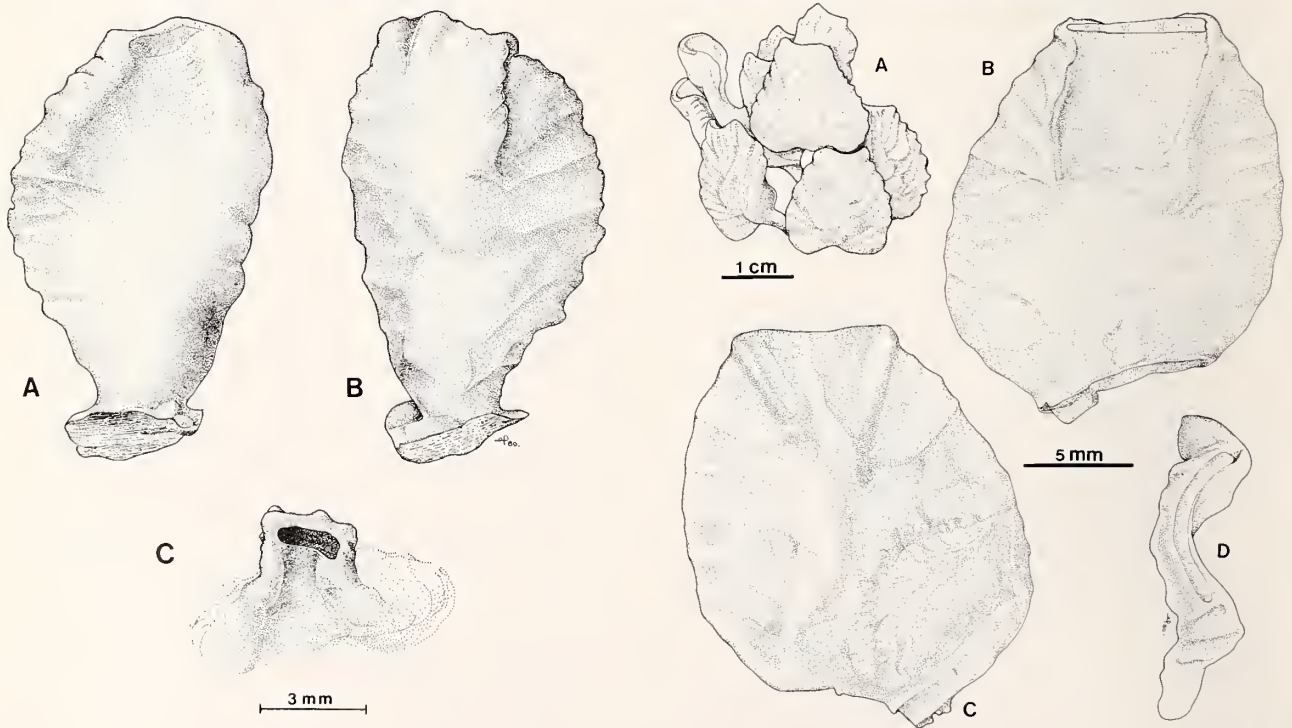
DISCUSSION

There are major differences within the genus *Conus* in regard to the number of eggs per capsule and the egg diameter. A review of the literature indicates that an inverse relation exists between the two (Figure 5). Of the many species studied by KOHN (1961a, b), all of those characterized by small egg diameters hatched as free swimming veligers; he found no species with nurse eggs. In contrast, OSTERGAARD (1950) reported that in the large-egged *C. pennaceus* (egg diameter 460 μm ; 80 eggs per capsule) eclosion takes place at a veliconch stage, virtually without a pelagic stage (not more than one day in the plankton). PERRON (1981a, b, c, 1983) has confirmed Ostergaard's observations on *C. pennaceus* and has found between 25 and 250 ova per capsule. Another Pacific species, *C. glans*, also produces eggs with large diameters (440 μm) and hatches as a veliconch with little or no pelagic stage (KOHN, 1961b). *Conus araneosus* from India has large eggs of 467–517 μm (NATARAJAN, 1957), but details of hatching are unknown. Furthermore, our results on *C. spurius* indicate that this species has the largest egg diameter among those reported for the genus, as well as the lowest number of ova per capsule. The shell size on hatching is, with *C. pennaceus*, the largest registered (880



Figure 2

Conus centurio. Spawn attached to an adult *C. centurio* (natural size) and detail of two egg capsules (3 ×).



Conus centurio. A, B, and C. Front (A), back (B), and tip (C) views of an egg capsule.

Conus ermineus. A. View of a fragment of an egg mass. B, C, and D. Front (B), back (C), and tip (D) views of an egg capsule.

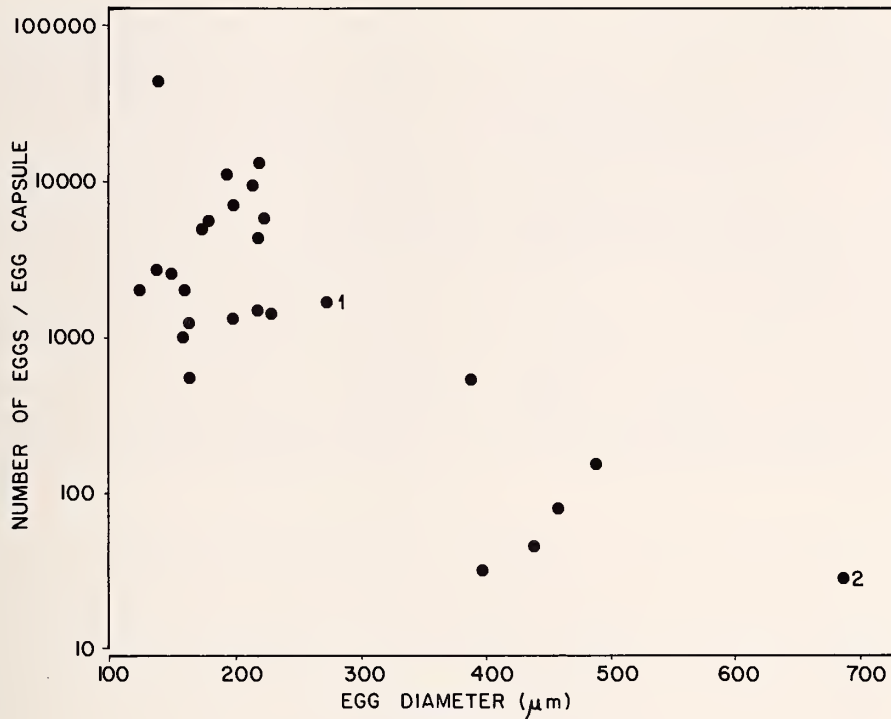


Figure 5

Number of eggs per egg capsule and egg diameter, for 26 species of *Conus*. 1 = *C. centurio*, 2 = *C. spurius*; other data taken from KNUDSEN (1950), OSTERGAARD (1950), NATARAJAN (1957) and KOHN (1961a, b).

μm in *C. glans*, KOHN, 1961b; 1100 μm in *C. araneosus*, NATARAJAN, 1957; 1200–1250 μm in *C. pennaceus*, OSTERGAARD, 1950, and PERRON, 1981a). The characteristics of the hatching form in *C. spurius* suggest no pelagic stage or a very short time in the plankton. However, D'ASARO (1970) studied the spawn of *C. spurius atlanticus* from Florida, and suggested that development in this subspecies indicated a planktotrophic veliger stage; he found 59 eggs per capsule, but did not report egg diameters, size, or characteristics of the hatching stage.

The eggs of most *Conus* species are either large or small (Figure 5). Those of *C. centurio*, however, are intermediate in size, and, together with those of *C. textile* and *C. striatus* (PERRON, 1981b), they provide the only recorded examples of *Conus* eggs with diameters between 240 and 340 μm .

The pattern exemplified by *C. ermineus* is more common: large numbers of eggs per egg capsule and small egg diameters, with hatching taking place as veliger larvae that presumably remain in the plankton for some time. It is interesting to note, however, that BANDEL (1976), studying Colombian material, reported *C. ermineus* egg capsules with a considerably lower number of eggs ("about 500") than found by us in the Golfo Triste (about 20% of our totals).

The egg mass of *C. spurius* has all the characteristics reported by D'ASARO (1970) for *C. spurius atlanticus*, and

it is also very similar to the description given for the Indo-Pacific *C. pennaceus* in the arrangement of the egg capsules in layers and in having decurved capsules (OSTERGAARD, 1950; KOHN, 1961b). In *C. ermineus*, egg capsules are arranged in rows in a single layer as BANDEL (1976) described, or in as many as three layers; egg capsules of *C. ermineus* were the largest egg capsules we recorded in the Golfo Triste *Conus* material.

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